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## A NEW TELE-PHOTO-OBJECTIVE.[1]

MR. ALBERT B. PARVIN, of Philadelphia, in the address before the Photographic Society, introducing his new tele-photo-objective, stated:

I bring before you to-night a new tele-photo-objective, from which some satisfactory results have been obtained.

You are all aware that in the tele-photo-objectives made by Dr. Miethe and Mr. Dallmeyer, the lenses are mounted in draw-tubes of considerable length.

In the specifications of one of the makers of tele-photo-objectives the positive lens is a well-known portrait lens. It is in four parts. Of these the hindermost can be screwed out a short distance. The negative combination lens is also in four parts, and is so mounted that by a rack and pinion the distance between it and the anterior element can be varied.

In the use of the instrument in the camera the focusing-glass is first set at any distance from the posterior face of the negative element, according to the amount of the magnification it is desired to obtain.

Then the focusing is effected by moving the positive anterior element to or from the negative posterior element by means of the rack-work provided for the purpose.

[1] Read before the Photographic Society, March 8th, 1893.

Finally, the sharpness desired is given to the focus by unscrewing the posterior lens of the anterior element to the necessary extent.

The tele-photo-objectives I have invented, and for which I have been granted letters-patent in the United States, do ***not have draw-tubes.*** The lenses are mounted in ***non-extensible tubes*** of very short length, and can be screwed into the lens-board of any ordinary camera.

What I claim for my invention is as follows: A photographic objective of simple construction and effective action, for enlarging the image of an object or objects at equal or unequal distances from each other with respect to the position of the camera. An objective having a ***non-extensible tube***, provided with a compound or combination lens, and a single negative lens of different length with respect to each other, for securing enlarged images of distant objects, with a marked degree of sharpness of detail.

The advantageous features of my invention are due to the character of the lenses employed in the ***non-extensible tube***, and to the depth of focus obtained from the use thereof.

The lenses being so constructed and mounted, in ***short non-extensible tubes***, can be used in any ordinary camera, thereby securing enlarged images of distant objects.

I wish to call your special attention to the great depth of focus obtained with these objectives.

I have here a 5 x 7 objective. The combination positive lenses are 6½ inches focus, the negative single lens is 6 inches focus, and are mounted in a ***tube of but 2⅝ inches long.***

The diameter of both lenses is $1\ ^{3}/_{32}$ inches. With this lens I have taken objects at a distance ranging from 100 feet to 4 miles, prints of which I will show you.

Exhibit marked "A" is a view of Camden, N. J., taken from Philadelphia, camera being placed in building Front and Chestnut Streets. The sign, "Taylor Bros.," the church steeple, and smoke-stacks, are about 6400, 9000, and 14,000 feet distant from the camera. The chimneys in the foreground are on Water Street and Delaware Avenue, Philadelphia, 100 to 200 feet from camera.

The lower print is the same view, camera standing in same place, but taken with a rapid Darlot lens of six-inch focus, and of same diameter as the tele-photo-objective.

(During the discussion Mr. Carbutt said he had seen the results of the efforts of various opticians who had attempted this class of work, and had been present at a meeting in London when Mr. Dallmeyer described his tele-photo lens. He had also seen work done by Dr. Miethe's tele-photo lens, and he must say that the lens exhibited by Mr. Parvin that evening, in his opinion, excelled anything that had been brought before the public. The evidence of this was before them in the prints exhibited. It was far superior to anything else in that line, and Philadelphia ought to be proud of the gentleman who had invented so perfect a lens. The Photographic Society of Philadelphia was well represented both in skilled photographers and opticians. It was evident they were progressing, and he felt certain that in the near future it would be found that America could turn out lenses equal to any that came from the other side.)

## ON THE DEVELOPMENT WITH ACID SOLUTIONS.

AUGUSTE AND LOUIS LUMIERE.

IT is well known that such substances as hydrochinone, eikonogen and paramidophenol, which have been in use for some years fail to reduce bromide of silver exposed to the light, unless we use them in an alkaline solution. It is on this account that they are generally known as "alkaline developers."

All organic developers, however, do not belong to the abovementioned class. Captain Abney, as far back as 1886, stated that pyrogallic acid in connection with sulphite of soda showed an acid reaction, and which, with the addition of either hydrochloric acid or bi-sulphite of soda still developed the latent photographic image.

Hydrochinone treated in the same manner does not act the same. In our reseaches in the function of development we had occasion to try numerous organic substances under similar conditions, and we have found that although development usually succeeds only by use of alkaline solutions, it also happens that

with certain substances an acid solution will reveal the photographic image.

As we were able to determine the chemical groups which characterize the developing substances, we found also the relations which can exist between the chemical constitution of such organic bodies and their property as photographic developers while the solution is in a neutral state or shows an acid reaction.

Independent of the interest attached to the theory of this question, it appeared to us a matter of great importance in a practical point of view, to determine what substances will allow us to dispense with the use of alkalies or alkali carbonates in the developing solution.

The gelatine layer or film which serves as a sub-layer to the bromide of silver on the sensitive photographic plate is very easily altered or effected when brought in contact with these alkaline solutions, especially in warm climates or during the heated period of summer, consequently great and important results are to be obtained by the use of such organic bodies as can reduce the haloid salts of silver without the addition of such bases.

No diphenols, diamines or amidophenols, which we have tried, and which in the same aromatic nucleus possess only two substitutes, hydroxylées or amidées, comply with the latter condition.

On the contrary, we are able to state that such substances as have three substitutes OH or $AzH^2$ will generally develop in an acid condition.

Thus in the case of diamidophenol :

$$C^6H^3\begin{cases}OH & (1)\\ AzH^2 & (2)\\ AzH^2 & (4)\end{cases}$$

Of triamidophenol :

$$C^6H^2\begin{cases}OH & (1)\\ AzH^2 & (2)\\ AzH^2 & (4)\\ AzH^2 & (6)\end{cases}$$

Of pyrogallic acid :

$$C^6H^3\begin{cases}OH & (1)\\ OH & (2)\\ OH & (3)\end{cases}$$

Of oxyhydroquinone :

$$C^6H^3\begin{cases}OH & (1)\\ OH & (2)\\ OH & (4)\end{cases}$$

Of diamidonaphtol :

$$C^{10}H^5\begin{cases}OH\\AzH^2\end{cases}$$

Derivatives of Martin's yellow, etc.

Nevertheless this remark does not seem to apply when the molecule contains an acid group COOH. We have already demonstrated what influence the acid function exercises on the development, and we also remarked that the reduction of bromide of silver with these substances requires an alkali, potassa, soda, or ammoniac, as the alkaline carbonates are not sufficient.

We have also shown that in certain cases even the presence of COOH can destroy the power of development; for example, gallic acid

$$C^6H^2\begin{cases}COOH\\OH\\OH\\OH\end{cases}$$

does not develop well, although it contains three hydroxyles, two of which are in the correct position. Finally, to be sure that the absence of developing properties is due to this acid group, methylic and ethylic substitutes have been used, when the following ethers were obtained :

$$C^6H^2\begin{cases}COCH^3\\OH\\OH\\OH\end{cases}$$

Methylic Acid.

$$C^6H^2\begin{cases}COC^2H^5\\OH\\OH\\OH\end{cases}$$

Ethylic Acid.

which developed perfectly.

On the other side we know that the amide groups, $AzH^2$, impress basic properties on the molecule which contains them. Therefore the influence of the acid function on the developing power is less energetic on the amines than on the hydroxyl bodies ; for example, the amidosalicylic acid

$$C^6H^3\begin{cases}COOH\\OH\\AzH^2\end{cases}$$

develops in a carbonate solution, while the protocatechic

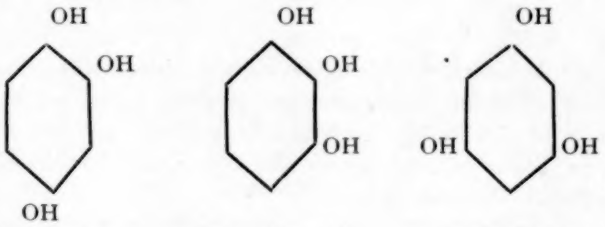
$$C^6H^3\begin{cases}COOH\\OH\\OH\end{cases}$$

requires a free alkali to reduce the bromide of silver.

These considerations prove, that in order to estimate the developing energy of an organic substance, we have to consider not only the number and the position of the hydroxyl and amide groups, but also the presence of a carboxyl, COOH, and the basic influence of the groups $AzH^2$.

Independent of these arguments we feel bound to remark that the developing power of triple substitutes or poly substitutes seems to increase when these groups are placed in such position, that if taken two and two, they will constitute a double developing function.

Thus the triple substitutes in ortho-para will be more reducing than those in ortho-meta, or the symmetric ones; for example, if we take the triphenols




Oxyhydroquinone Pyrogallic acid Phloroglucine

The oxyhydrochinone is extremely energetic, the pyrogallic acid will have less reducing power, and the phloroglicine, which has its substitutes in position meta, in harmony to the other, will not develop at all.

We think that we can conclude our opinions which have led us to the following results: *That the substances which present more than two substitutes OH or $AzH^2$ (except the symmetric triple substitutes), and especially those which possess different times the developing function, and the molecule of which does not contain the acid group COOH, are susceptible to develop in a neutral solution and even in an acid solution.*

The bodies which possess this constitution, which besides are very soluble in water, appear to us should be preferred henceforward, by reason of the superiority which this property gives to them.

## "SOME ADDITIONAL NOTES ON AMIDOL."

THE paper lately read before the Photographic Society of Philadelphia, under the above title, is so entirely at variance with the real facts and the published statements of the leading photographic authorities of the world, that the matter deserves more than a passing notice.

The paper in its entirety was distributed to various periodicals for publication, under cover of the Society, irrespective of the fact that some of the erronous statements had been ignored by the organization in its official report, and as many persons look to the papers read before the Society for information, and accept them as a safe authority,—we consider it a matter of duty to set the Photographic Society, as a scientific organization, right before our readers.

The gentleman who read the paper, at a previous meeting, took umbrage at a question asked by a member during discussion, in which the latter ventured the intimation that the new German developer, "Amidol," showed an acid reaction, and that it brought forth the latent image with all the characteristics of the older developers without the use of any alkali.

The upshot of the matter was the paper in question, which sets forth claims diametrically opposite to such eminent accepted photographic authorities as Eder, Scolik, Vogel, Schnauss, Liesegary, Stolze, Lumiere, Bolas, and others; and not only tends to work an injury to the manufacturers of the new Amidol by bringing it into disrepute, by suggesting worthless combinations, but might also entail the loss of much valuable material to such as attempt to follow the theories advanced.

We will now consider a few of the statements in the paper: It will no doubt be news to the photographic profession at large to know that "ferrous oxalate" is a developer neither acid nor alkaline.[1] Possibly the gentleman's photographic experience does not extend so far back as the days of ferrous oxalate development, which, by the way, was first formulated in

[1] *Photo. Times*, March 3d, p. 114.

Philadelphia by Carey Lea in 1877, and as perfected by Prof. Eder in 1879, is to-day probably the most largely used developer by the photographic bread-winners throughout continental Europe.

Anyone having any knowledge of ferrous oxalate development must know the importance of an acid reaction. For his information we will give a few formulæ and facts which are known to all intelligent photographers, viz.:

Dr. J. M. Eder's original formula:

| | | |
|---|---|---|
| A. | Neutral oxalate potassium . . . . . | 200 g. |
| | Distilled water . . . . . | 800 c.c.m. |

*Acidulate* with oxalic or acetic acid.

| | | |
|---|---|---|
| B. | Proto-sulphate of Iron, cryst. . . . . | 100 g. |
| | Distilled water . . . . . | 800 c.c.m. |
| | Sulphuric acid . . . . . | 5 minims. |

Charles Scolik, the eminent photographic authority, distinctly states ("Photographie with Brom-Silver," Vol. I., p. 163) that unless the developer is acid,—*i. e.*, turns *blue* litmus paper *red*,—fog will result.

Eastman formula of the present day:

| | | |
|---|---|---|
| A. | Oxalate of potash . . . . . | 1 lb. |
| | Hot water . . . . . | 3 pints. |

*Acidify* with oxalic acid. Test with litmus paper.

| | | |
|---|---|---|
| B. | Proto-sulphate of iron . . . . . | 1 lb. |
| | Hot water . . . . . | 1 quart. |
| | Sulphuric acid (or citric acid ¼ oz.) . . | ½ drachm. |

Any chemical text-book for beginners will give the requisite information about litmus paper.

After this digression, we will pass to the main subject of Amidol, and the labored efforts of the experimentalist to show that the new developer must be of alkaline character. After wading through half a dozen vague experiments (?) *without showing a single result*, or submitting any proof whatever to the Society, he branches out with the statements: "*Moreover, could find no support for the acid theory in any of the recent publications*

*concerning this new developing agent;*"[2] and further on asks the question, "*Let us look for a moment to see whether there is the least evidence of a documentary character to support the claim that Amidol is Acid.*"[3]

Now let us see what the facts of the case actually are, and how much dependence is to be placed upon the statements made before the Society.

The simplest way to have proved the matter would have been to mix up the solution before the members present, and test with litmus paper. This simple test, however, was entirely ignored and a labored argument was substituted in its place to substantiate an erronous position.

As a matter of fact, there is hardly a single photographic periodical in the world which during the past year has not commented on the acid peculiarity of the new reducing agent, all of which, however, seem to have escaped the notice of the orator of the evening.

For his information we will give a few quotations from well-known *recent* publications by persons who *are* acknowledged authorities in the photographic world, and whose published opinions will doubtless be accepted by everyone as evidence of a a documentary character.

PROF. DR. J. M. EDER, in *Photographische Correspondenz*, No. 381, June, 1892, page 278.

Amidol.—It is characteristic of this developer that with an *acid* reaction of the solution it energetically develops the image on brom-silver-platine plates, and that thereby an *alkaline* reaction is not only useless, but absolutely harmful.

Ibid, No. 382, July, 1892.

I wish to mention that the discovery of the Amidol developer, which, without alkali carbonates (with mere sulphite), energetically develops with an *acid* reaction, is due to Herr Dr. Deiterle, etc.

DR. F. STOLZE, in *Photographische Nachrichtere*, Berlin, No. 25, June, 1892, page 338.

[2] *Photo. Times*, p. 14.
[3] *Photo. Times*, p. 116.

The new Amidol Developer.—The most important feature is that it acts with an *acid* reaction. . . . *Any addition of alkali fogs the plate.*

Ibid, No. 29, page 386.

Amidol *reacts acid*, and must not be used with any alkaline solutions, as they invariably produce dense fog. Amidol, therefore, belongs *with ferrous oxalate in the class of acid developers.*

Dr. R. Ed. Liesegang, in *Photographische Archiv*, No. 706, Nov. 16, 1892, page 337.

Amidol.—Characteristic, that the solution having an *acid reaction*, develops brom-silver-gelatine plates.

Dr. J. Schnauss, in *Deutsche Photo. Zeituug*, No. 49, Nov. 1892, page 419.

Amidol.—The substance, specially suited for the development of gelatine dry plates, excites the interest of the photo-chemist by its property ; that the solution acts energetically *without* any reaction of alkali, etc.

Bulletin de la Society Francaise de Photographie.

Amidol.—The characteristic of this developer is that, with an *acid* reaction of the solution, it developes energetically prints on gelatine-bromide of silver plates, and if an alkaline reaction be given to it, not only does this not improve it, but is injurious.

Prof. O. Lohse, the photo-astronomer, in *Photographischer Almanach* for 1893, page 17.

Amidol energetically reduces the silversalts in the presence of *nentral* sulphite of soda, withont any addition of alkali whatever.

Dr. H. W. Vogel, in *Anth. Bulletin*, Aug., 1892, page 456.

Amidol has the remarkable property that it requires no alkali.

W. T. Wilkinson, in *Wilson's Magazine*, Dec., 1892, p. 712.

The great value of Amidol lies in the fact that it is a developer by itself, requiring *no alkali* to bring its reducing powers out, etc.

Photographic Times, Dec., 1892, page 641.

The solution of Amidol, modified by the sulphite, is *still acid.* The alkalies cannot be employed ; they impair its reductive action.

F. C. BEACH, in *American Amateur Photograper*, November, 1892, pages 478 and 479:

"The marked difference Amidol has over other developing agents is that is quite soluble in cold water, can only be used with neutral sodium sulphite, in place of an alkali, and refuses to develop in an alkaline solution. It is *distinctly an acid-developing agent*, etc."

THOMAS BOLAS, F.I.C., F. C. S., in *Photographic Work*, Vol. I., page 78:

"Amidol will develop without the additi of any salt having an alkaline reaction."

COL. J. WATERHOUSE, I.S.C., Assistant Surveyor-General of India, in *Photographic Work*, Vol. I., page 404.

"The peculiarity of Amidol as a developer is that it can be used without alkali; by itself it is only a very weak developer; with alkali it gives weak images very liable to stain, but n solution of 5 parts in 1000 of water with 50 to 100 parts of sod um sulphite it becomes a very energetic developer, etc."

As to the alleged quotation from the Hauff patent specification to support the erroneous statements,[1] they are so palpably false that we simply refer to the specifications in the British patent which the gentleman himself has the temerity to quote in the face of the true facts.

And thus we might go on indefinitely through the whole category of photographic periodicals, and yet this gentleman "can find no support for the acid theory in any of the recent publications," or "*the least evidence of a documentary character to support the claim that Amidol is acid.* In the face of the whole photographic press, German, French, English, and American combined.

However, the greatest incongruity of all is that in conclusion the gentleman, in direct opposition to what he attempts to show by his experiments, "suggests that Amidol be used dry and fresh, in connection with a strong solution of sodium sulphite, or it be dissolved in weak *sulphurous acid*, either pure or

[1] *Photographic Times*, page 117.

made by the regulation formula of Cramer (sodium sulphite, 1 dram; sulphuric acid, 15 minims; water, 6 ounces).[6] This mixture, as any schoolboy knows, will turn *blue litmus paper red*. Now, if this is not an acid reaction, what is it?

Were it not that the credit of the Photographic Society of Philadelphia is involved by the unauthorized distribution of the paper, we should have passed the whole subject as a matter unworthy of serious notice or consideration.

JULIUS F. SACHSE.

## THE CONQUESTS OF MODERN SCIENCE.

SURELY I have established my thesis that dirt is only matter in a wrong place. Chemistry, like a thrifty housewife, economizes every scrap. The horse-shoe nails dropped in the streets are carefully collected, and re-appear as swords and guns. The main ingredient of the ink with which I now write was probably once the broken hoop of an old beer barrel. The chippings of the traveling tinker are mixed with the parings of horses' hoofs and the worst kinds of woolen rags, and these are worked up into an exquisite blue dye, which graces the dress of the courtly dames. The dregs of port wine, carefully decanted by the toper, are taken in the morning as seidlitz powder, to remove the effect of the debauch. The offal of the streets and the wastings of coal gas re-appear carefully preserved in the lady's smelling-bottle, or are used by her to flavor blanc-manges for her friends. All thrift of material is an imitation of the economy of nature, which allows no waste. Everything has its destined place in the process of the universe, in which there is not a blade of grass or even a microbe too much, if we possessed the knowledge to apply them to their fitting purposes.—*North American Review.*

[6] Report of the Photographic Society of Philadelphia, page 19.

## CONCERNING MOUNTANTS.

BY CHARLES MACLAURIN.

A GOOD mountant is such an important and useful thing that no excuse is needed for devoting a special article to it. I shall try to be both clear and concise in what I have to say, for nobody ever read a long, sham-scientific-style sort of article —at least, such is my experience.

One hears a great deal about various mountants—glue, gelatine, arrowroot, and so forth—but my own experience is that nothing comes up to our old friend starch. Clean, inexpensive, not injurious to the print, easily made, easily applied, it is undoubtedly the best mountant we possess—but it must be good starch I think it is because most people get the cook to make their starch that it has fallen into such disrepute. That estimable female never bothers her head about such a little point as crushing it up properly; it is really a matter of supreme indifference to her whether it should stick or not. Now there is one way to make starch and one way only. Get a cup and put into it about a teaspoonful of starch, and mix with cold water till it is about the consistency of cream. Pound the starch very fine, leaving no lump big enough to see. Then pour on boiling water—really boiling, mind—till it forms an emulsion, and the starch is made. If it is too thick—which is not likely, by the way—add more hot water.

You must add some antiseptic to waylay the bacterium termo, or your starch will only keep a few days. There are many such. Methylated spirit used to be my favorite. I used to add it after the starch was made, having purposely made the latter too thick, and thin it down with spirit. However, the new excise regulations have turned methylated spirit into such a fearful compound of filth that I am really afraid to trust a delicate print to its tender mercies.

Alcohol is an excellent antiseptic, but is expensive. Use it in the same way as methylated spirit. Whiskey will not do—even Irish, which Scotchmen consider the nearest approach to prussic acid that there is—I believe.

Corrosive sublimate (1 in 1,000 solution) and carbolic acid (1 in 20) are, of course, facile princeps among antiseptics; but as they are sold under the Poisons Act, then on-medical reader will have difficulty in getting them. Both are most virulent poisons; the corrosive being poisonous both when it gets into the blood by a scratch or wound and when it is swallowed, so they should not be left about if the reader gets hold of them. Strong carbolic acid may be applied after the starch is made, while it is still warm. Twenty or thirty minims of it will keep four ounces of starch till doomsday, if it is well shaken up. But be careful what you do with these fearful poisons.

Oil of cloves is an excellent preservative. However, I do not care for the smell of it myself, so I have little practical experience of it. I believe a teaspoonful of the oil to four ounces of starch is sufficient.

And now we come to my own favorite, boracic acid. It is cheap, fourpence an ounce, which will do for quarts of starch, not poisonous, and very efficacious. In addition, a solution of it at 100 deg. F. is the very best thing you can get for sore eyes.

To make starch with it put a little into the first water you use. Boil it till it dissolves, for it dissolves very slowly in cold water. Then mix up the starch thoroughly with it, and proceed as before. About a teaspoonful of the crystals will keep four ounces of starch indefinitely.

By the way, a solution of boracic acid is a useful thing to have about the house. If a dog bites you or a cat scratches your hand, one should always wash the wound both in hot water and some antiseptic such as boracic or Condy's fluid to prevent blood-poisoning, for one never knows what putrid matter the animal may have been feeding on. Even the harmless cut finger should be treated antiseptically. Not long ago a young friend of mine was seriously ill of blood-poisoning from neglecting a simple scratch of the pen-knife. Boracic acid is as good as anything for this.

Well, I have wandered from my original subject; but the few hints above are certain to be useful to some one or other. They have often enough been useful to myself.—*The Amateur Photographer.*

# THE COLOR OF BIRDS' FEATHERS.[1]

BY WITMER STONE.

THE subject of the nature and development of color in the plumage of birds has within the past few years attracted considerable attention, and it is to be hoped that in the near future we will be better acquainted with this most interesting question.

The colors of bird's feathers are divisible into two classes according to their origin—*i.e.*, those which are due to the structure of the surface of the feathers and those which are due to pigment.

The first group is seen to best advantage in the brilliant metallic hues in the plumage of humming-birds, trogons, birds of Paradise, etc. All of the brilliant colors exhibited by these birds are due entirely to the interference of light waves caused by fine parallel grooves on the surface of the feather, or by the presence of very thin plates of the horny substance of which the feather is composed placed one upon the other.

By far the greater number of birds, however, owe their colors to the presence of pigment in the feathers,—common examples being the varied hues of the parrots, the red of the cardinal bird, and the yellow of the orioles.

Mr. Chas. A. Keeler, in a very important paper just published on the "Color of North American Land Birds,"* has advanced some original and highly interesting theories upon the subject of color evolution.

Taking up the orioles (*Icteridæ*) as an illustration of his views; he considers the primitive color of this group to have been olive-green, a mixture of black and yellow—the two pigments which seem to produce all the color effect in the orioles. He considers the olive to have been the primitive color of the group, because it would be most natural for the minute particles of pigment to be indiscriminately mixed at first. Later the effects of natural and

[1]Extract from a lecture delivered at the Academy of Natural Sciences, Philadelphia, Mar. 15, 1892.

*Occasional papers of the California Acad. of Sciences, III.

sexual selection, which produce the varied plumages, of the male birds, have caused the separation, and concentration of the yellow and black pigment in different portions of the plumage, resulting in the various species of black and yellow orioles. Further, Mr. Keeler finds a constant tendency in yellow pigment to become intensified into orange and red, and in the orioles, in direct proportion as the specialization of a species has advanced from the primitive olive hue, we find the yellow tint passing more and more into a reddish orange.

Mr. Keeler has termed the colors yellow and red, *correlative colors* on account of this constant relationship between them, and doubtless further investigation will show conclusively that similar relationships exist between other hues.

## POSITIVES REVERSED FROM THE ORIGINALS.

BY M. BALAGNY.

THE various methods of obtaining reversed results on gelatino-bromide plates date from about thirteen years back when it was pointed out that a gelatino-bromide plate treated with an alkaline bichromate, and exposed somewhat longer than ordinarily, would give a completely reversed result, the reversal being so complete that a negative could be reproduced satisfactorily by contact printing on a bichromatised platino-bromide plate, the reproduction being, in this case, reversed laterally, and so suited for collotype and some other photo-mechanical processes.

This method of reversal was published almost simultaneously by investigators in England and France, and has been occasionally worked commercially as a practical means of producing a reversed negative from an ordinary direct negative; but, in its original form, it was altogether unsuited for camera work, owing to the length of exposure required. Indeed, so long was the exposure, that all manipulations could be conducted by the dull light generally employed in ordinary printing-out processes.

M. Balagny has just made so important an advance in the reversal process as almost to constitute his method of working as a new process; and, moreover, the way in which he uses the bichromate may open a path for some interesting speculations as to the nature of the latent image.

A practical and complete reversal process, which can be carried out with ordinary camera exposure, is so important a matter that we give a virtually full translation of M. Balagny's communication to our Parisian contemporary, *L'Amateur Photographie*.

Several investigators have occupied themselves with the question of images by reversal on gelatino-bromide plates, and the experiments of Captain Biny, which were published in the May number of the *Bulletin* of the French Photographic Society, for May 1881, may be mentioned; Captain Biny's method only involved one development.

More recently, at a meeting of the Paris Photographic Club, held on 15th of April, 1891, M. Rossignol made a communication on the same subject.

The method of M. Rossignol involved two developments. With these early processes success was possible, but the author has endeavored to find a method by which a positive image of an object could be obtained with ease and certainty.

The early workers operated in daylight, but our present author works by the light of the dark room, and to this he largely attributes his success; and although he used pellicles or films in his experiments, the remarks apply equally to work on glass plates.

Exposure having been made in the ordinary way, development is effected in an old or slowly-acting hydroquinone developer, made up as follows:

| | |
|---|---|
| Water - - - | 1000 grammes. |
| Sulphite of soda - - | 250 " |
| Hydroquinone - - | 15 " |

For use, the above quantity should be diluted with its own volume of water, and an addition of five or six cubic centimeters of bromide of ten per cent. potassium should be made. During

development, a twenty-five per cent. solution of carbonate of soda is added as required.

Development of the plate—that is to say the development of a negative image—being complete, a thorough washing is given to the plate, after which it is laid, film upwards, on a plate of ebonite, and the film surface is exposed at a window to diffused light for ten to twenty seconds.

The plate is now washed for a short time, and it is next immersed in the following:

| | |
|---|---|
| Water - - | 1000 cubic centimeters. |
| Bichromate of potash | 30 grammes. |
| Nitric acid - - | 12 cubic centimeters. |

This bath changes the black metallic silver, which forms the image, into the brick-red chromate, and the action should be allowed to continue until it is just possible to trace the positive formed by the darkening of the whites resulting from the exposure at the window. The plate is now thoroughly washed to remove the whole of the bichromate, after which the plate is again treated with a developer. The hydroquinone developer already mentioned will serve quite well, or a pyrogallic acid developer may be used. During this second development, those parts which were originally white become reduced and black; thus the reversed image is obtained, and all that is required is washing and fixing in the usual way.—*Photographic Work.*

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**The Propulsion of a Fish.**—The naturalist Marcy, in his chromophotographic studies, it seems photographed the movements of a sting ray in his natural element, and obtained a series of results by which the movement of the fish can be analyzed. In his last announcement, the noted scientist showed a series of photographs taken within one-tenth of a second of each other, and called attention to the great similarity of the movement of the fish to that of a bird in its flight,—a peculiarity now for the first time made visible to the human eye by the aid of modern photography, so that it may be truly said, in reality a fish does not swim but flies through the water.

## REPRODUCING NEGATIVES FROM PAPER PRINTS.

WE have lately been retrying the old experiment of reproducing negatives which have long been lost or destroyed, from prints that have been taken many years since, and the success attending the effort has been such as to warrant our bringing the subject before such of our less experienced readers as may not be aware of this method of reproducing a negative.

It is very curious, that in prints produced from some of these negatives there is to be found more detail than is to be seen in the prints from which the negative was made. This is not difficult to understand when we consider that in a strong print—one obtained from an intense negative in which much of the finer details in the shadows had to be sacrificed in order that the lights might not be altogether chalky, and thus get buried in the substance of the paper, presenting only a uniform blackness on the surface—such details are still found to exist if the print is examined when held against a strong light. Make a print on albumenized paper from any intense negative, continuing the exposure until nothing but the highest lights are visible on the surface, and when held up against a strong gas flame and viewed as a transparency, the details that are lost under examination by reflected light are still to be seen when the light is transmitted through it.

The print selected for making a negative of ought to be as vigorous a one as possible; and from what has just been said it will be seen that it is not an objection, but quite otherwise, that the deep shadows are clogged or seemingly obliterated.

The way by which the prints are removed from their mounts is to place them in lukewarm water for a few minutes, until upon raising up one corner of the print from the mount it is found to strip off. It is sometimes necessary to increase the heat and prolong the time of immersion to ensure this, as much depends upon the nature of the paste by which it was mounted. When removed, the back of the print must be carefully sponged so as to remove any adherent paste. It must then be dried between sheets of blotting-paper.

The printing frame that is to be employed in reproduction must be fitted with a plate of stout and flat glass. On this the print is laid, face up, and a dry plate superimposed—face down, of course. It is not easy to indicate the exposure that should be given, but five seconds to a common gas flame with an ordinary slow plate proved ample in the last trial we made. A slow-acting, weak developer has been hitherto preferred by us, but the selection of this depends upon the softness or the intensity of the print. When the negative thus made has been finished, it is ready for being printed from.

The method here described presents important advantages over the reproduction of a negative by the camera. By the latter nothing is copied but what appears on the surface, whereas the method advocated reveals what is concealed in the texture of paper. We have one reproduction which forcibly illustrates this. The scene is one in the Mariposa Grove, California, and in the original print one portion is presented in such deep shadow as to reveal no detail whatever. It was first copied by the camera without showing more than was originally visible; but when copied by transparency as described, a group of figures not hitherto seen in the print became plainly visible, and now forms an addition to the pictorial value of the print, more especially now that a lantern slide has been made from it sufficiently crisp and sharp to betray no suspicion of its having had a paper origin. Without having yet tried it, we can scarcely suppose that a print on a gelatine emulsion paper will show the same discriminative power in the burying of detail that one on albumenized paper will, seeing that in the former case the image is confined to the thin pellicle which contains the silver haloid, whereas in the latter the silver nitrate not only sensitizes the albumen film, but penetrates beyond it—a fact that is easily proved by the stripping off of the albumen and observing the vigor of the image still visible on the denuded paper.

With a view to facilitating the printing and destroying granularity in the paper we have rendered one-half of a precisely similar pair of stereoscopic prints translucent by Canada balsam varnish, allowing the other half to remain in statu quo, but have not

found any advantage to arise. It may, however, prove advantageous with thick and uneven paper.

While on this subject, and correlative to the foregoing, we may remark on a useful application of the principles of producing a negative from a paper print with which, several years prior to the advent of modern dry-plate photography, the names of Valentine Blanchard and Claud Leon Lambert were associated. Given a negative imperfect, from whatever cause, a print is produced from it, which, when fixed and washed (it need not be toned), has the lacking detail put in with a pencil or a brush, or too dark shadows lightened by any of the reducing agents now so well known. This, then, forms a cliché, from which a negative is printed on finely surfaced paper, and which in turn, after further retouching if requisite, is employed as a negative to reproduce perfect impressions of the original. Some sixteen or eighteen years ago this system formed the means of producing many excellent prints, which were justly much admired. We mention this as the method appears to have fallen into abeyance.—*The British Journal of Photography.*

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**Have Your Photograph Ready.**—No one should fail to keep his photograph on hand all ready for the newspapers. No matter how completely your past life has reflected your opinion that the post of honor is the private station, there is no telling how soon you may be called upon to take a Cabinet position or be elected president of a suburban bowling society. And then, if the photograph is not at hand, the reporters will lie in wait for you with kodaks, or the recently used wood-cut of some escaped convict will be trotted out to do duty for you. Better yield to the inevitable and keep on hand in your desk the photograph of you which makes you look most dignified and distinguished. One far-seeing and modest man of the listener's acquaintance went further than this; he had his portrait "processed" and blocked, and carried the cut about him all the time ready to deliver it to the first reporter who should call upon him at the moment when he should become famous.

# ON THE APPLICATION OF PHOTOGRAPHY TO SEISMOLOGY AND VOLCANIC PHENOMENA.

BY PROF. W. K. BURTON.

THERE is scarcely a branch of art or science that does not at the present day call in the aid of photography, either directly or indirectly, and Seismology is no exception. It may, therefore, not be out of place in the case of a journal particularly devoted to this subject, to enumerate and briefly describe the various applications of photography that have actually been made, or that are suggested, in connection with earthquake and volcanic phenomena.

First, of course, we have the common application of photography to record the effects of earthquakes and of volcanic eruptions. The value of photographs of this kind cannot be overestimated, but it will not be fully appreciated till considerable time has elapsed, and until future Seismologists want to compare the effects of earthquakes and eruptions of their time with those of the present time. We can imagine of what value they will become if we think what we would give for an accurate set of photographs of the effects of any historical earthquake or eruption, say of the last century. Undoubtedly a hundred or two of years hence, it will be of the greatest importance to geologists to be able to compare the condition, for example, of Bandai-san with its condition within a few days of the eruption, that blew its upper half into the air nearly five years ago. The more rapid changes in the interior of the craters of active volcanoes can also thus be noted with advantage. Even such secular movements as the gradual rising or depression of coasts may also, perhaps, be recorded more definitely than they have been heretofore.

There is one thing that should be emphasized here, and that is the importance of preserving systematically all photographs of the kind mentioned, printed by some permanent process. In cases where the photograph is of such general interest that the outside public may be looked upon for the purchase of anything over about 50 copies, the collotype process is at the time of

writing to be recommended, in other cases the platinotype, in spite of its present comparative expensiveness on account of the recent great rise in the price of platinum. Up to the present time, so far as the writer knows, such photographs as are of particular seismic interest are to be found scattered through various publications, but have not been systematically brought together in any single collection.

Prof. John Milne has used photography in determining the curvature of the sides of volcanoes.

That is to say, the inclination and curvature were measured from photographs at the time in existence In using photographs for this purpose it is necessary to be sure that the swing back of the camera was vertical at the time the photograph was taken, otherwise the measurements will not accord with the truth. Now, although photographers have been pretty well drilled into appreciating the necessity of having the swing back of the camera vertical in the case of buildings, there are few that appreciate the necessity in cases where the subject contains no right lines, and the greater number of photographers "tip" the camera without bringing the swing back to the vertical again, in photographing a high mountain. This is, indeed, one of the reasons for the commonly unsatisfactory rendering of mountains by photography. The effect of tipping back the camera, without readjusting the swing back, is to give an effect in the photograph, as if the mountain were leaning away from the camera to just the amount that the ground glass leans back. In other words the slope of the mountain is reduced, and the mountain is dwarfed. There may also be slight errors due to refraction.

We next come to another set of uses of photography that need little more than enumeration. Thus the record of an earthquake, by nearly every seismograph, is scratched on smoked glass, the smoke film being afterwards fixed with common photographic varnish. It goes without saying that photography is the best way of obtaining copies of such records. The blue process is most commonly used, although, in the case of the small diagrams given by bracket and duplex pendulum seismographs, more delicate processes have a decided advantage. Except for

want of permanency, albumenized paper is to be preferred to anything else.

It scarcely needs to be stated that photography has been useful in producing illustrations of seismological instruments, also, in a number of matters of detail such, for example, as the production of scales, with finer division than any that were readily procurable machine divided.

We now come to a consideration of more special adaptations of photography to seismological, and, to avoid the necessity for repeating his name every few lines, I state here that nearly all these adaptations are the work of Prof. John Milne, F. R. S., the writer sometimes giving assistance in some of the purely optical and photographic parts.

Some two years or so ago, an attempt was made to find whether any change in electrical potential between the earth and the atmosphere preceded, accompanied, or followed earthquakes. An instrument to keep a continuous potential record was devised on the following lines. One terminal of a mirror galvanometer was connected with a metal plate in a well of considerable depth, the assumption being that the potential of the well water would be the same as that of the earth at the same depth. The other terminal was carried to a metal plate at the ground level. A beam of light was thrown on the galvanometer mirror and, being reflected, was received on a photographic plate, narrow and long, kept moving slowly in the direction of its length by clockwork. A continually changing potential was shown, and there were several cases in which there were decided deflections at the times of earthquakes, but there was not sufficient consistency in these to make it evident that they were the result of anything but the mechanical effect of the shocks on the galvanometer. The subject is one that yet requires attention.

There has been much investigation of "earth tremors" and "earth tilting." We are accustomed to look on the "solid earth," apart from its planetary motions, as the very type of what is stable and steady, but it is now known that it is never at rest. It is always trembling, and there is reason to believe that its surface is often slowly tilting in one direction or in another. These motions

are extremely small; to get indications of them, much less to measure them, is very difficult, and, up to the present, it has been impossible to separate them, one from the other, with certainty. Thus no tremor recorder has yet been made of which it can be said with *certainty*, whether it is recording true tremors or "tips." An ordinary pendulum will be affected by "tilts," but not by tremors, unless these happen to coincide with its period. The difficulty is to record in any way the extremely small motion of the bob of the pendulum. A partly successful attempt was made to solve the difficulty by photography. A silver bead was suspended by a silk fibre in a hollow stone column, which prevented atmospheric influence. A beam of light was thrown on the bead, and the image or the point of light, passing through a micro-objective, placed vertically below the bead, gave an image of a spot of light on a plane at a consitlerable distance below it, along which a photographic plate could be made to travel by clockwork, the motion of the bead being, of course, greatly multiplied,—being in fact multiplied in the ratio of the distance between the bead and optical centre of the lens * and the distance between the optical centre * of the lens and the plate receiving the image.

A word or two should be said on the optical principles here involved. If a silver bead were a perfect sphere, or indeed, if the surface were everywhere convex, the form only approximating to a sphere, the spot of light produced by the reflection of any source of light, say a lamp flame, could be made as small as might be desired, without being reduced in brightness. The further the source of light is moved away from such a bead, the smaller becomes the spot, but its brightness remains the same, and is, indeed, at all distances, leaving air absorption out of the question, the same as the source of light itself, less a constant percentage of loss on account of absorption of light at the reflecting surface. This arrangement is, in fact, the "artificial star" used by opticians in testing telescopic and other objectives, when it is not convenient or possible to focus on an actual star.

It was thought that, in the case of this instrument, as the spot of light could be made indefinitely small, at will, the image of

* More strictly one of the "principal points" of the lens.

the spot could be made as small as might be desired, however great the amplification. It was found, in practice, that this was not the case. If the amplification were great enough to be useful, the spot of light was too large to draw anything but a very wide line. The lens was a high class ¼ inch micro-objective, and the fault was probably not in it. It is likely that the bead was not really convex throughout, but that the surface consisted of minute facets, or more likely grooves. If a bead of mercury could by any means be used the results would probably be much better.

Excellent results have been got by the aid of photography by the tremor recorder described in the report on the Volcanic Phenomena of Japan. (British Association Reports, 1892.)

The only difficulty here is that it cannot be known for certain whether these instruments are showing tremors or "tips." In this case the light passing through a narrow vertical slit, behind which there is placed a small lamp, passes farther through an objective, is received on the mirror, and is from it reflected on to a horizontal slit in the front of a box which contains a photographic plate moving vertically by clockwork. Of course any motion of the mirror of the instrument, whether produced by tremors or "tips," is amplified by the beam of light, whilst the horizontal slit cuts off all superfluous light, so that a spot only reaches the plate. Daily observations were taken on plates 12 inches long, 2½ inches broad, moved by clockwork, at such a rate that they took 24 hours to travel their whole length. With this slow travelling vibrations were not separately registered. The breadth of the line across the plate indicated the amplitude of the vibration at any particular time, and showed that these attained a maximum at intervals of five to ten minutes. In working with these slow speeds it was found that the light of a small kerosene lamp was ample, if the plates were rapid, but it was considered advisable to get a record of the actual separate vibrations during "tremor storms." To do this the plate was caused to travel rapidly, at the rate of 12 inches in about 30 seconds. With this rapid travelling the light of a lamp was quite inadequate, and a magnesium light produced by the burning of a magnesium ribbon was

used. The annexed diagram illustrates the sort of records that were got on the slow travelling and on the quick travelling plates. Fig. 1, that showing the result on a slow travelling plate, is actual size, representing a part of the plate only. Fig. 2, showing the result on a quick travelling plate, is reduced to its present size from a length of 12 inches.

Of course the line of light that did the actual photographic work was an image of the slit, which slit was made very narrow. I was surprised, in connection with this, to find how little difference it made what kind of objective was used to cast the image. A high class portrait objective was suggested, as on account of the perfect correction for both the spherical and chromatic aberrations of the pencil's axial, or nearly so, I thought that the results would be much superior to those got with an inferior lens. To my surprise there was very little difference between the results got by the use of such a lens, and those got by the use of a single double-convex, or "crossed" lens, not even achromatized.

In 1887 MM. Fouque and Michel Levy described a set of experiments they had made to determine the rate of transmission of shock of an earthquake nature, produced by exploding dynamite, and in other ways, through different kinds of soil, using a photographic arrangement for recording the time and durations of vibrations. An incandesent electric lamp threw a beam of light at an angle through a lens and on to the face of mercury in a dish. The reflected beam of light was brought to focus on a revolving plate. If there were no motion, of course the light simply drew a circle. If there were any vibration, the beam of light was set in motion, and the circumference line of the circle was widened, and became indistinct. Thus the beginning, duration, and ending of the motion was indicated.

So much for what has already been done. It may be worth the necessary space to say a word or two about applications of photography that are, as yet, only contemplated

In the case of all seismographs at present in use the "steady point" is a comparatively heavy mass of metal. There are no objections to this in the case of slight earthquakes, but in the case of great ones, when we have tilting, the mass is liable to

over-swing the mark and to exaggerate the motion. There is also the objection that it is never known for certain whether "tips" or lateral motions are being registered. It is possible that this difficulty may be got over by the use of a very light "steady point" but in such a case the ordinary method of drawing the record by a point scratching through a smoked film on glass, will not be admissible, as the friction would be too great. It will be necessary, in this case, to resort to photography, which introduces no friction at all.

At places where no regular seismological observatories are situated it is often desirable to have a record of the time of occurence of earthquake. The simplest way of doing this automatically is to have an arrangement whereby a clock is brought to a stop at the moment an earthquake begins. One objection to this arrangement is that thus stopping a clock makes it often difficult for observers to reset it at standard time. It has been suggested that a photograph of the face of a common watch might be taken at the instant an earthquake occurs. Were earthquakes so considerate as always to take place in the day time, there would be very little difficulty about the affair, but unfortunately they are not, and the difficulty is about a night illuminant, because of course, the exposure must be very short to show the second hand of a watch fairly well, and this necessitates a very bright artificial light. Some experiments made several years ago were very encouraging. Since then "magnesium cartridges" have been introduced, and there is no doubt that an arrangement could be devised whereby one of these could be ignited at the instant an earthquake occurred, and if the ignition took place fairly near the dial of a watch, a photograph showing the hands could be made even with a lens of only moderate angular aperture. It is somewhat doubtful, however, whether such an instrument could be placed in the hands of one unskilled in the use of scientific instruments, and the object of watch photography is to get an appliance that may be placed in the hands of anyone.

On the other hand, it has suggested itself to the writer that the difficulty might be got over by fixing a minute silver bead on the end of each of the three hands of the watch. On the princi-

ple described above, in connection with the pendulum tremor recorder, the spot of light reflected by such beads ought to impress themselves on a plate with a fairly short exposure, even if the light be nothing more powerful than an ordinary lamp. The arrangement whereby a camera, with shutter to be released by an earthquake, a watch, and a lamp might be enclosed in a box so as to effect the desired result would not be complicated.

There are various other investigations in connection with which photography may possibly be used. Thus, although the motion of an earth particle during an earthquake has been very fairly investigated, there are still wanting data as to the relative motion of two earth particles at some distance from each other. It is of great importance to know what such relative motions are, as according to whether the motions of the earth particles at some distance apart are nearly in the same phase at the same time, or are in entirely different phases, is the effect of an earthquake on a building due to the inertia of the mass alone, or is due to racking. The construction of buildings to best resist these two destructive influences would be entirely different.

It is possible that photography may be used in connection with such investigations, but it is more probable that entirely mechanical means will be employed.

If the very long water level (at least several miles) proposed some time ago by Prof. Milne to discover whether there is any slow, tipping motion of the land in certain planes, be carried out, it may be found convenient to register the height of the water at the two ends of the level photographically.

It would, however, be possible to go on indefinitely enumerating the purposes to which photography might be used in connection with seismology, but those given must suffice.

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**The museum** of the Photographic Society of Great Britain has been enriched by a copy of Fox Talbot's "Sun Pictures in Scotland," a set of daguerreotype apparatus, and some calotype negatives.

## THE EYE—PAST AND PRESENT.

THE last one hundred years have increased the need and capacity for work upon small objects near at hand, one of the questions occurring to the mind is, do these different and increased demands bring increased facility and capacity to the human eye? Eyes are now used in ways never imagined by our remote ancestors, possibly never dreamed of in the Oriental countries. Whatever there may have been in the way of sculpture among the Greeks demanding artistic and accurate vision, there was no type-setting, no electric telegraphy, no stenography and no typewriter. The eye of the patriarch Job was constituted at birth, and went through life to old age, very much such an optical instrument as that of the English squire who devotes himself to an outdoor life in the eighteenth or nineteenth century; but Job had no printed books to beguile the tedium and pain of his seat in the sand and ashes. The examination of the mummies in the Egyptian mausoleums shows that there has been no change in the anatomical conformation of the human ear in 4,000 years, and there is no evidence that there has been any in that of the human eye; but the difficulty of preserving the eye for examination centuries after it has ceased to see, prevents us from proving it. It is safe to say that it has not changed in any essential or anatomical form during the time of the human race upon the earth. But, as we have just intimated, the demands upon it and its occupations are much more exacting and very different from those that obtained among the classic Greeks and Romans or the patriarchal Arabians.

The tendency of the people of our civilization to live in large towns, in the bad air, and with the absence of light incidental to such life, may have brought the human eye into many more dangers than those that come to it in a rural occupation. Yet accidents to the human eye in rural life are not at all rare. It may be that civilization generally attains the loftiest plane in large cities where the intellectual activity is most intense. With this came increasing demands upon the visual power, and often

under improper conditions. But if the nineteenth century civilization of great towns has brought great dangers to the sight, it has also achieved great triumphs in the matter of examining the eye, so that we may determine and increase its power for work, and find out and cure its diseases. It is perfectly possible, by means of the instruments of the nineteenth century, to exactly learn the optical condition of an eye, to decide just what glasses, if any, are needed for its perfect working; and it is also possible to look in upon it, and by the appearance of its tissues and its blood vessels to decide as to the existence of serious disease, when there are few other symptoms that point to it, when there may be none besides to be found in the body that positively prove it. We may mention two classes of disease, one constitutional and the other local, which illustrate this latter statement; the eye mirror ophthalmoscope is the instrument by which such things are settled. Bright's disease, a name carrying dread to many a household, is the constitutional disease to which we refer. In not a few cases the diagnosis of it is made by the examination of the retina with the eye mirror. The expert will make no mistake if the eye gives evidence of it, for its signs are positive, in minute bleedings from the blood vessels and peculiar fawn colored spots on the retina. The surgeon dreads to find them, because they are evidence of advanced stage of the malady which prematurely destroys so many lives. Bright's disease is a degeneration of many of the tissues of the body, the walls of the arteries being among them. In no part of the body can this degeneration be so readily detected as in the retina of the eye.—*The Optician.*

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**The Duke de Morny,** like many other persons, has made himself an amateur photographer, and acquired a remarkable dexterity. He has even succeeded in sensitizing the commonest paper, and in directly obtaining a portrait upon any sort of written or printed document. From research to research, he has improved photographic processes to such a point that he is able to obtain two portraits for the sum of one cent.

## GELATINE MOUNTANTS.

AGAIN we embrace the opportunity to caution the photographic public against the use of the gelatine mountants which are put on sale under various alluring names, and for which superior advantages are claimed over the old and well-tried mountants in common use.

In previous editions we have had occasion to call attention to these compounds, and the deleterious action of the glue, gelatine, and glycerine, entering so largely into their composition. Independent of the fact that they affect the permanency of the image, and that no dependence is to be placed on these so-called patent anti-cockling mixtures, as to their adhesive properties under different atmospheric conditions. Now we hear of another deficiency, and which, according to a prominent commercial photographer in Philadelphia, forms an additional objection to their use, as he found out by experience.

Having a number of foreign prints to mount for an album, he was persuaded to try one of these highly-recommended anti-cockling nostrums. After giving the prints ample time to dry, his assistant attempted to burnish them the same as regular starch-mounted photographs. However, the first attempt resulted in a ruined print, the heat of the burnisher evidently melting the improved (?) mountant. Thus it proved with the whole lot. Any attempt to burnish the views ended in the destruction of the print. Whether the mixture could not become thoroughly dry or was melted by the gentle heat is a question. It is certain, however, that they could not be run through the burnisher.

This is but another reason why such nostrums should be given a wide berth by the professional photographer.

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**Iodine Starch.**—A new mountant under above name has been put on the market in Germany. Dr. H. W. Vogel, in a late article in *Photo-Notizen*, speaks favorable of it.

## ELEMENTARY OPTICS.

A SOLAR beam of light is a bundle of rays, a ray being the smallest portion of light which can emanate from a luminous body. Each of these rays possesses distinctive characters, both as regards their chemical functions and colors. Sir Isaac Newton proved that the white light emitted from the sun is not so simple as it appears, but is composed of vivid colors and tints which we may prove to our own satisfaction, by performing the beautiful experiment called "Newton's Analysis of Light," being a prism (Fig. 1), or triangular mass of glass, which is so contrived that it may be adjusted to any angle, or placed in any required position. The shutters of the room being closed, we may admit a ray of light either by boring a hole in the shutters or separating them a little.

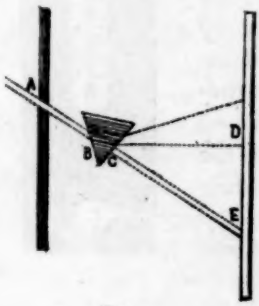

FIG. 1.

The ray of light A E (Fig. 1), being admitted into the darkened room by means of a hole A in the shutter. It will be seen that the space between the shutter and the spectator is traversed by the sunbeam or ray of light which appears to cause little particles of dust to dance in the atmosphere of the room. This appearance, however, is owing to the illuminating power of the sunbeam contrasting with the other darkened or non-illuminated space in the room, which renders the small particles of dust floating in the air visible. As soon as the prism B C (Fig. 1) is placed in the path of the sunbeam, so as to allow it to fall on one of its angles B, the ray will be refracted, or bent out of its course, so as to pass towards the back of the prism (as in the line D), and not in the same line A E that it would otherwise have done, had not the prism been interposed. Another effect also takes place: an elongated delicately-colored image is formed upon the wall D E; and if you stand at a short distance from the prism you

will see that these colors are spread out in a triangular form, the base of which is on the wall, and the apex, or point of origin, at the back C of the prism. Remove the prism, and it is seen that the splendid display of colors upon the wall has disappeared, and a round spot of white light E is seen below the place occupied by the solar spectrum.

The colored image upon the wall is called the *prismatic* or *solar spectrum*, which, according to Sir Isaac Newton, is composed of seven different colors (Fig. 2). The color at the lower portion of the image, or that nearest to the round white spot E on the wall when the prism was removed, is of a red color, and the one at the other end is of a violet color; the whole intermediate parts being occupied by five other colors, and the whole arranged according to the table exhibited below, the proportion of each color having been measured by Fraunhofer with the greatest care, with the results placed opposite to each corresponding with the 360 degrees of a circle, the red ray being the least, and the violet the most refracted of this chromatic image:

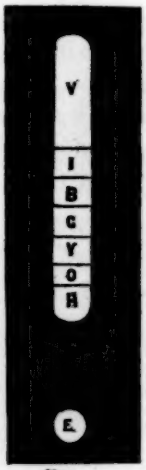

FIG. 2.

| | |
|---|---|
| *Top.* | |
| Violet | 109 |
| Indigo | 47 |
| Blue | 48 |
| Green | 46 |
| Yellow | 27 |
| Orange | 27 |
| Red | 56 |
| *Bottom.* | — |
| | 360 |

Since Newton's time, various experiments have been instituted and other rays detected: for instance, a crimson or extreme red ray has been discovered below the red ray, by examining the solar spectrum through a deep blue glass; and Sir John Herschel observed a lavender beyond the violent ray, by throwing the spectrum upon a piece of yellow paper. Mr. Stokes has also proved the existence of an extra spectral ray far beyond the violet; but, as we have remarked before, our consideration of light does not extend beyond its practical use to photographers.

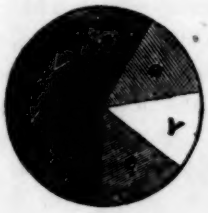

FIG. 3.

Sir Isaac Newton was of opinion that white light was composed of seven primary rays, each composed of a certain degree of refrangibility, or capability of being turned out of its natural course; and he also considered that the color of a ray indicated its angle of refraction. Sir David Brewster has demonstrated that the seven primary colors, as Sir Isaac Newton called the rays of the solar spectrum, are not primary, but that only three of them are so—viz., blue, yellow, and red; the rest are compounds of the three primary colors, which form the spectrum by overlapping each other; and these are explained in the annexed diagram (Fig. 3).

Such are a few of the phenomena relating to light regarded by the philosophers; its applications to photography, are as follows:

Of the real nature of the rays which form the sunbeam, little is known. The theory of Newton consisted in supposing the ray of light was produced by the emission of minute particles of matter traveling at an enormous velocity from a luminous body, and, when these minute particles impinged on any body, they were either thrown back, reflected, or absorbed, according to the surface on which they fell.

These particles entering the human eye, produce the sensation of light on the retina, which sensation is conveyed through the optic nerve to the brain.

The theory of the celebrated Huygens pre-supposes that the space beyond our atmosphere, and the interstices between the molecules, or ultimate atoms of all bodies, are filled with an im-

ponderable ether, and that light is produced by the oscillation or vibration of this ether, which undulation is set up by some self-luminous body—of course, the sun.

Another theory may here be mentioned, although but very slenderly supported—namely, that set forth by Oersted, who considered that light was the effect of a rapid succession of minute electrical discharges taking place between a luminous body and the eye. Leaving these theories, however, to the philosopher, let us see how they affect the photographer.

Tne sunbeam—the ray of white light—contains powers within it of which the earlier philosophers had but a faint idea; besides its accompanying heat, there is a principle associated intimately with it, which has the power of decomposing and of determining the recomposition of chemical compounds. This principle has been already alluded to—it is "Actinism," and is as perfectly distinct in the nature of its properties from light as light is from the principle of heat, with which it is closely connected.

Actinism may then be considered as the fundamental principle on which photography is based; and we would wish, before entering on a description of the various methods of obtaining sun pictures, to draw a broad distinction between light and actinism, more especially as many apparent difficulties present themselves, and seem almost insurmountable until tried by the principle we are about to lay down.

From what has been said, it will be supposed that what we consider light exerts a decided influence over certain chemical salts having a metallic base; but it now becomes necessary to show that light does no such thing—it is not *light*, but *a component part of light* which exerts this influence. In order to explain this seeming anomaly, let us consider the subject a little more carefully. A ray of white light consists of the three primitive colors —blue, yellow, and red; and their combinations, forming, *en tablette*, the following: Violet, indigo, blue, green, yellow, orange, red; these colors and shades being produced by the decomposition of white light by means of a prism. Of these shades, the *violet* has the greatest reducing or decomposing power. By this, I mean that the *violet* part of the decomposed portion of light

exerts the most powerful influences on the unstable metallic salts, reducing them to their bases. This action is the *actinic* of the photographers; and the study of the action itself may be properly designated as *actinic-chemistry*. Every beam of light which we receive from the sun is composed of the three primary colors; these blending, one with the other, form shades or *mixtures* of the three; thus we get four shades independent of the primitive colors, viz., indigo from blue and violet, green from blue and yellow, orange from yellow and red.

It may be asked, Where does the violet come from? It is easily accounted for thus—if we decompose a single ray of white light, we get the following component parts by means of the prism:

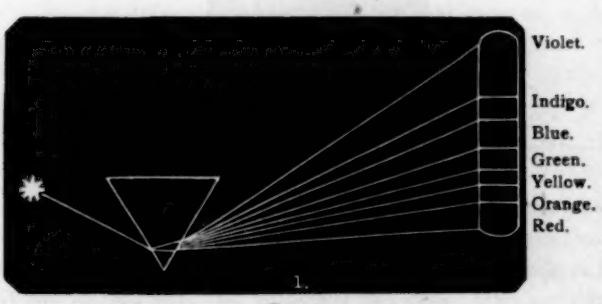


FIG. 4.

Now, if we decompose another ray, just below the above, we get the same parts reproduced, thus—violet comes first, or next the red, and is evidently produced by the mixture of red and blue (the next primary color), or, more properly speaking, by the mixture of a deep red, which slightly extends lower than the red of the visual spectrum, with the indigo of the ray immediately above the under one; now this ray, or portion of the ray, has the power of more perfectly decomposing the unstable salts of silver than any other of the series; and, therefore, has acquired the term *actinic ray*.

The actinic power, and the light-giving power, may be more fully explained in the following diagram:

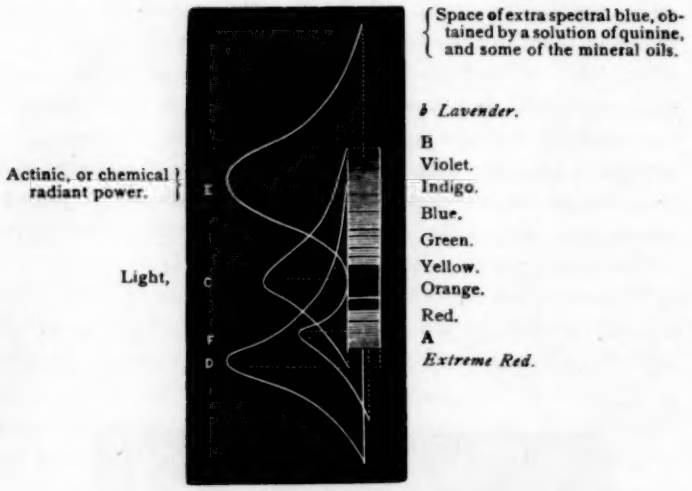


FIG. 5.

In the above diagram, the greatest actinic, or chemical action, is shown opposite the violet ray E, and the least opposite the mixture of the yellow and orange C; below the red at A the actinic power becomes active again, because the extreme or deep red is about to pass into the violet with the indigo of the blue in the ray next below; at the same time, the part of the ray giving the brightest light is opposite the yellow and orange light C. We observe, also, that the point giving the greatest heat is just below the red D; but with that we have nothing to do. We thus ascertain that the chemical, or photographic action is confined, as already stated, to only a portion of the visual ray of light.

(*To be continued.*)

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**The Daguerreotype.**—At a late meeting of the Society of Arts in London on the occasion of the reading of Mr. Dallmeyer's paper on tele-photography, a high tribute was paid to the value of the daguerreotype process, as the only photographic process by which the maximum of microscopic definition could be obtained.

**Personality** is no argument.

**World's Columbian Commission.**—Upon January 14 last the rules and regulations to govern the matter of awards at the World's Columbian Exposition were adopted. These rules provide among other things that each exhibit shall be examined by an individual judge, who must be so far as possible a competent expert, and must formulate his opinion of an exhibit in writing and sign his name thereto, and that this report must receive the confirmation of the Departmental Committee of which he is a member. There are thirteen of these Departmental Committees, one of which is assigned to each of the thirteen great Departments of the Exposition, and these thirteen committees compose the Board of Judges. There will be foreign representation upon each of these thirteen committees, and also one or more women judges upon all committees authorized to award prizes for exhibits which may be produced in whole or in part by female labor.

It is the desire of the World's Columbian Commission to compensate judges, but this will depend upon the action of Congress, to which application has been made for an appropriation sufficient to defray all expenses connected with this subject of Awards. Should the appropriation be made, judges from the United States will receive $600 each, and those from foreign countries $1,000 each. Their work should begin June 1 and last two months.

The management of this whole matter is in the hands of this Executive Committee on Awards, which is receiving applications for appointments as judges at their temporary offices and address as above. After March 15 the office will be permanently established in the Administration Building of the World's Columbian Commission, at Jackson Park, Chicago. As the judges are to be so far as possible competent experts, and the duties of the position require efficiency and ability of a very high order, and it is the desire of the Executive Committee to appoint only those absolutely qualified for the place, and, whenever possible, of national and international reputation, this Executive Committee considers it its duty to call the attention of the technical journals of the country to the facts in order that it may receive the assistance and co-peration of those who by their position and connections are best able to assist the committee. It is not possible to make this announcement in the way of an advertisement, and the information is sent you in the belief that it is of sufficient interest to your readers to obtain some form of mention in your journal, and that you will suggest the names of such experts as you know to be of the capacity required.

JOHN BOYD THACHER.

*Chairman Executive Committee on Awards.*

## A WORTHY CASE FOR CHARITY.

SOME months ago a call, headed by the *St. Louis and Canadian Photographer*, was issued and published in the various photographic journals, calling attention to the condition of Mr. H. H. Snelling, who was at one time one of the brightest lights in photographic circles, both literary as well as professional.

It will be remembered that Mr. Snelling forty years ago was the publisher of the *Photographic and Art Journal*, a periodical of the highest order, and fortunate, indeed, is the photographic student or society that is in possession of a set of these journals of the olden time. Mr. Snelling in the days of his editorial activity did probably more than any other person in this country to popularize the art science of photography, and elevate its standard. Further, it must not be forgotten that to him, more than to any other, is due the breaking down of the patent monopolists who about forty years ago attempted to prey upon the photographic bread-winner. By this service alone he earned a claim upon the present and future generations of the craft.

Mr. H. H. Snelling, now in his extreme old age, is in dire distress, bowed with age, and almost entirely blind, and unable to do anything whatever towards his own relief, and if it were not for the charitable heart of our editorial brother of St. Louis, the old photographic and literary veteran would now be in the Cornwall (N. Y.) Poor House. Rescued from such a sad fate by brother Clark, he was taken to St. Louis, and for seven months has been an inmate of his house. Arrangements are now about completed to secure a place for this aged toiler in the field of photography in the Home for Aged People in St. Louis, a haven of rest wherein he can end his days in peace and quiet, free from care and worry. To accomplish this laudable object, a final call for aid is now issued. Additional funds are needed. The appeal should not be in vain. Any charitably-disposed photographer, be he professional or amateur, who feels inclined to assist in this good work, and aid the old pioneer in his distress, can remit his mite or contribution, as the case may be, to the publishers of this journal, who will see that it is duly remitted.

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**It is better** to be ignorant than to sail under false colors.

# The Editorial Dropshutter.

## THE WORLD'S FAIR CONGRESS OF PHOTOGRAPHY.

AND now our esteemed contemporary from Chicago sees fit to pounce down upon us in his wrath, all on account of our leader in the JOURNAL of November last, criticising the action of the "Committee of the World's Congress Auxiliary on a Congress of Photographers." Now if the editor of the *Photo-Beacon*, or whoever inspired the charge made against the AMERICAN JOURNAL OF PHOTOGRAPHY, will kindly read our paper over again, carefully and without bias, he will find that the JOURNAL is not quite so pessimistic in its policy towards the proposed Congress of Photographers at the World's Fair as our Chicago contemporary would like to make its readers believe.

In fact our paper was written solely in the interest of, and for the success of, the photographic department of the great fair. From what we understood of the actions of the main committee at the time, we feared that just such a state of affairs would result as is to be gathered from the wail in the *Photo-Beacon*, which follows the fling at the AMERICAN JOURNAL OF PHOTOGRAPHY, viz:—

"But while the Committee of the Congress of Photographers is unexceptionable, and includes men and women thoroughly acquainted with the needs of photography in all its phases, they cannot themselves make it a success. They will build the mill, arrange the machinery, and construct the dam with its leader, but they cannot supply the water necessary to set the great wheel in motion; that must come from photographers from all over the world."

Now, what have this Committee of the World's Congress Auxiliary done since April 19th, 1892, when they issued their preliminary address, up to the present time, to interest the photographic public in the world at large, and insure the success of this department of the great exhibition. So far as we know

nothing, absolutely nothing. We have watched our exchanges carefully to see whether anything in the way of reports or announcements was issued, which did not reach this office, but failed to find any official utterance of this Committee, which certainly had within its grasp the chance to do the greatest work for the photographic art-science ever placed in the hands of any single set of men.

The only information of the Committee's progress which has thus far come to our notice, is the article published in the *Pacific Coast Photographer*, December, 1892, signed J. B. B., and which was evidently written by the chairman of the Committee. This paper gives the first bit of information as to the papers to be read before the Congress in August next; the papers are six in number, out of the large number announced. Strange to say, the same journal prints an attack upon the Editorial Staff of the AMERICAN JOURNAL OF PHOTOGRAPHY because we criticised what seemed to us an arbitrary action of the aforesaid Committee.

Be it distinctly understood that we have no fault to find with the gentlemen who compose the Committee,—personally, they are all unknown to us. But it is to the apparently unbusiness-like methods of the Committee in letting the precious time slip by without letting the world know what is being done, together with the strange treatment of the photographic press and the arbitrary selection of the "Advisory Council," with which we find fault. As the *Photo-Beacon* states "they can build the mill, but cannot supply the water," or, in plain words, the Committee can furnish the space and building, but have thus far failed to interest the representative photographers to supply the exhibits and papers which are necessary to make the scheme a success.

Shifting the responsibility and attempting to strike at a photographic periodical at long range will not better matters.

The proper way to insure success for this "proposed Congress of Photographers at the World's Fair" is to enlist the aid of the photographic press at large throughout the country, setting aside all sectional jealousies, and publish their progress before the public.

It is not yet too late to recover lost ground, and if the Committee fail to take advantage of the short time yet left, they will have but themselves and their short-sighted policy to blame for the failure.

In conclusion we will reiterate what we have before stated that we trust :—

"That whatever Committees be in charge will act with wisdom, care and impartiality, having in mind the advancement of the art, irrespective of personal favoritism or sectional jealousies."

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**Photographic Work.**—Volume I., 1892, is now on our desk, substantially bound ready for the shelf. It forms a concise and complete record of all phases of photographic activity for the past year. The editors and publisher have well kept their promise outlined in the salutatory, that they would furnish their readers with the details of all phases of photographic progress, avoiding all superfluous matter. *Photographic Work* should be in the hands every American photographer who wants an English photographic periodical.

**A Well-Deserved Compliment.**—The Hadfield steel foundry Company, Ltd., of Sheffield, England, has placed a large order with the Gutekunst Company of Philadelphia, for phototypes of their products of manganese steel castings and forgings made under the Hadfield patents. This order was sent unsolicited. Specimens of the Gutekunst product which had come to the notice of the Sheffield Company attracted their favorable notice, and correspondence and the order ensued.

**Pedantry.**—Our valued English contemporary *Photography*, in the issue of March 2d, makes merry and attempts to criticize and correct the AMERICAN JOURNAL OF PHOTOGRAPHY as follows.—

"An American contemporary puts a couple of items thus : 'Among the shoal of amateur photographers who spread *themselves* over England during the past season—where one seems to have lost her heart, the other apparently lost his head.'

"We infer that the grouping of these two persons in one paragraph is to simply adorn a tale and not to indicate any connection. We should have supposed a *shoal* would have spread *itself*, but it spread *themselves*

according to American English, which is one of the 'tricks that are vain' not confined to the heathen Chinee."

So far so good:—if there is anything that pleases the writer of the original paragraph it is to be corrected when in error. But anyone setting himself up as an authority should first be sure he is right before he goes ahead—a rule which is the standing one with the writer in the first instance. Now it would have been well for *Photography's* critic, before attempting to show his pedantry, to have obtained a grammar for beginners, and posted himself on collective nouns and their uses; then he would not have made himself quite so merry over the matter. However, to set our critic at rest as to which is correct we will state that we have the authority of no less a person than Prof. W. Hudson Shaw, the eminent English lecturer and student, now travelling in this country, for the correctness of the collective noun "shoal." We would further call the attention of our would-be critic to the fact that a noun may be singular in form yet name a community of objects, as for instance "committee," which may assume the plural form in the pronoun "they."

**Fine Photographs.**—We are in receipt of three fine prints from negatives by Edgar Richards, Esq. The subjects are: Lake Minnewaska, N. Y., Awasting Falls, and the Palmegalt, Minnewaska, N. Y. The prints for technique, detail, and artistic selection of view are hard to equal; we congratulate Mr. Richards on his expertness as a photographer.

**Thumb Photography.**—The latest fad in photographic circles across the water is to have one's finger prints pictured. An impression of the lines of the first finger or thumb is made with printer's ink on a card, and this print is reproduced on an enlarged scale by the aid of the camera. An authority on palmistry says that the lines on the fingers are sign-manuals which endure in all their minutiæ from childhood to old age. This being so, and of course photographers encourage the idea, a fac-simile of these lines would serve as a ready means of identification where other tests might fail, since no two people have markings exactly alike.

**The Manifold Use of Hypo.**—The Walpole Chemical Company, of Wampole, Mass., now manufacture a hyposulphite of soda which is one-fifth stronger than the commercial grades usually sold. A recent analysis by Prof. J. H. Fiebing, of Milwaukee, demonstrated among other uses the superiority of this hypo for chrome tannage in the manufacture of morocco leather.

# Society Notes.

**Society Reports.**—The movement, started about a year ago by an English contemporary, of cutting out all superfluous matter from society reports, has met with general favor. It is well known that although the proceedings of photographic societies frequently contain information that would prove useful outside of the limited circle in which it has its origin, theories are occasionally advanced and statements made which the organization as a body would hardly like to endorse. Consequently condensed reports, confined strictly to the propagation of useful knowledge and correct information, will no doubt soon be the order of the day.

**The Photographic Society of Japan.**—A special meeting of the above-mentioned society was held on Friday, February 3d, at the rooms of the Geographical Society (Chigakukiokai), Nishibonyacho, Kyobashi, Tokyo, at 4 P.M., the business being to consider the resignation of Mr. I. Isawa, the Japanese Treasurer, and to consider the election of a new Treasurer and additional members of Committee. Mr. W. K. Burton took the Chair.

It was put from the chair, and carried unanimously: (1). That Mr. Isawa's resignation be accepted. (2). That a cordial vote of thanks be accorded Mr. Isawa for his services as Treasurer of the Society since a short time after its establishment. (3). That Mr. Kajima Seibei be elected Japanese Treasurer, in place of Mr. Isawa. (4). That Mr. I. Isawa be elected a member of Committee. (5). That Mr. George Brinkworth be elected a member of Committee to represent the interests of Yokohama members.

An ordinary monthly meeting of the Society was held at the same place at 5 P.M., Mr. Edmond R. Holmes in the chair.

The proceedings ended with a vote of thanks to the Chairman.

**Photographic Society of Philadelphia.**—At the regular meeting of the Society, held March 9th, 1893, the new Tele-photo-objective of Mr. Parvin was shown and explained. Mr. Alfred Clements also gave a demonstration of the new cold platinum precess. Mr. Bell showed the defining powers of the new concentric lens. Officers for the coming year were nominated.

Conversational meeting March 22nd. A set of lantern slides was shown, contributed by the Rockford, Pittsburg and Chicago Societies. A number of fine slides by members were also shown upon the screen. The lantern was ably manipulated by Mr. Edmund Stirling.

**Minneapolis Camera Club.**—At the club rooms, Wednesday evening, March 22d, the Murdock-Wunderlich Co. gave a demonstration of the working of the Murdock Aristotype paper. Sample packages of the paper were distributed among those present. This was the first of a series of practical demonstrations that will be given at the club rooms during the spring and summer season.

**We received** a cordial invitation to attend the Exhibition of Photographs by the Society of Amateur Photographers of New York, held at 111-115 West Thirty-Eighth Street, New York, March 15th-25th, 1893. Unfortunately we were unable to be present.

**California Camera Club.**—On Wednesday evening, March 15th, 1893, a club talk was held, and the set of slides sent out by the Brooklyn Academy of Photography, Brooklyn, N. Y., was shown. Sunday, March 19th 1893, an outing was made to Niles Canyon, the start being made on the 8.30 a. m. boat from Market Street wharf, returning from Niles, San Francisco, 6.15. The fare for the round trip was $1.10.

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**Photographing the Sounds of Vowels.**—At the recent international congress of physiology at Liege, Prof. Hermann demonstrated his method of photographing the sound of vowels. The vowels were sung out before one of Edison's phonographs. Immediately afterward they were reproduced very slowly, and the vibrations recorded by a microphone. The latter was furnished with a mirror, which reflected the light of an electric lamp upon a registering cylinder, covered with sensitized paper and protected by another cylinder with a small opening which gave passage to the rays of light from the reflector. By this means were obtained very distinct photographic traces, and the constancy was remarkable for the different letters.

**Mrs. Draper,** widow of Professor Henry Draper, the astronomer, regularly pursues the scientific work that her husband made a specialty —the photographing of stellar spectra and the preparation of a descriptive catalogue of the explorations.

# In the Twilight Hour.

NO man can be provident of his time who is not prudent in the choice of his company.

---

FRIENDSHIP improves happiness and abates misery by the doubling of our joy and dividing our grief.

---

EMPLOY your time well if you mean to gain leisure; and since you are not sure of a minute, throw not away an hour.

---

WORK while it is called to-day, for you know not how much you may be hindered to-morrow.

---

ONE to-day is worth two to-morrows.

---

THE greatest wisdom of speech is to know when, what, and where to speak,—the time, matter, manner; the next to it is silence.

---

THOSE men who destroy a healthful constitution of body by intemperance and an irregular life, do as manifestly kill themselves as those who poison or drown themselves.

---

DO good if you expect to receive it.

---

A GREAT reputation is a great charge.

---

ENVY and covetousness are never satisfied.

---

IN the company of strangers silence is safe.

---

HE teaches me to be good that does me good.

---

IN the commission of evil fear no man so much as thyself. Another is but one witness against thee; thou art a thousand: another thou mayest avoid; thyself thou canst not. Wickedness is its own punishment.

GRATITUDE preserves old friendship and procures new.

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ALL between the cradle and coffin is uncertain.

---

HE that can read and meditate need not think the evenings long or life tedious.

---

WITHOUT constancy there is neither love, friendship, nor virtue in the world.

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A DANGER foreseen is half avoided.

---

A CIVIL denial is better than a rude grant.

---

PERFECTION is attained by slow degrees. It requires the hand of time.

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THE PRECEPTS of the law are these: To live correctly, to do an injury to none, and to render every man his own.

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ASK THY purse what thou shouldst buy.

---

ALMS is the golden key that open the gate of heaven.

---

HE that speaks ill of another, commonly before he is aware, makes himself such a one as he speaks against; for if he had civility and good breeding, he would forbear such language.—*Selden.*

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DEBATES.—An useless wagging of tongues where the noses have already been counted.

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EGOTISM.—Suffering the private I to be too much in the public eye.

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SENSE and beauty, like truth and novelty, are rarely combined.

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DULNESS, like magnetism, loses none of its power by imparting its virtues.

# Literary and Business Notes.

THE Hawaiian Islands are the key to the North Pacific. If they fell into the hands of one of the great European powers, we should be compelled to fortify our Pacific Coast and to maintain a naval force in that ocean at enormous expense. The mere fact of our firm possession of the Hawaiian group as an integral and inalienable part of our national territory, instead of making future international complications probable, is precisely what will tend to keep such complications at a minimum. We can protect our Pacific Ocean commerce, guard our Western coast line, and maintain our control of the prospective canal, at less than half the expense for fortifications and ships, if we hold Hawaii, that we should be compelled to incur without the islands in our possession. The article we print elsewhere in this issue well emphasizes the commercial and strategic importance of the one halting-place at the "cross-roads" of the Pacific. As a matter of military economy, we cannot afford to be without Hawaii.—*From the "Progress of the World," March Review of Reviews.*

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WHAT would you do if assured by scientific men that the world would come to an end within the next twelve weeks? The long-promised novel of Camille Flammarion, "Omega: The Last Days of the World," proves to be of thrilling interest. It is the conception of one of the world's most distinguished astronomers, worked out within the bounds of scientific possibility. While educating the reader in the most modern phase of science, it is as full of interesting surprises as "The Arabian Nights Entertainment." The most interesting part of this wonderful novel is found in his description of the trepidation and expectation into which the people of the world are thrown. Imagine the condition of the stock exchange with a fact of such import staring them in the face. The opening chapters will be found in the April number of *The Cosmopolitan* magazine.

Probably no novel has ever been presented in an American magazine with such illustrations as accompany Flammarion's "Omega," which commences in the April *Cosmopolitan*. In the list of illustrators are to be found the names of Jean Paul Laurens, Rochegrosse, Chovin, Vogel, O. Saunier, Gerardin, and Meaulle.

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PRACTICAL POCKETBOOK OF PHOTOGRAPHY. By Dr. E. Vogel. Macmillan & Co., New York. A short guide to the practice of all the usual photographic processes for professionals and amateurs. A translation of the second German edition by E. E. Conrad, F.C.S.

The little volume is a concise compendium of the photographic processes, illustrated with numerous wood-cuts, etc. It is a handy volume for both professional and amateur, and is fully up to the requirements of the present time.

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PICTURE MAKING IN THE STUDIO BY PHOTOGRAPHY. By H. P. Robinson. The Scovill & Adams Company, New York. No. 42 of the Scovill Photographic Series.

A useful book for the professional photographer. The chapters composing the book will be recognized by readers of photographic literature, most of them having been previously published under the titles of "Picture Making in the Studio," "Individuality," etc., which well deserved to be preserved in a permanent form.

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DANA, the well known photographer of New York, had an opening at his new photographic studio, 101 Fifth Avenue, Pittsburgh, Pa., on Tuesday, January 31st, February 1st, 2d, 3d, and 4th. The exhibition consisted of aquarelles, pastels, water colors, porcelains, miniatures, ivoryettes, photo-portraits. The music was furnished afternoons from three until five, eveniugs from eight until ten, by Guenther & Rothleder's orchestra.